Omada EAP Solution 1

EAP Indoor Wi-Fi Solutions for Small-Sized and Single-Subnet Networks

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Background

Visitors to bars, cafés, restaurants and shops, and to offices and conference rooms, increasingly expect to receive free Wi-Fi as part of the experience. For small-scale public locations with a high-density of end users such as these, Wi-Fi infrastructure should be built that can handle concurrent access from a large number of devices, whilst also maintaining a stable network when receiving a large number of connection requests. Features such as portal authentication and VoIP services are essential to allow modern businesses to create a customized network that's suitable for both themselves and their customers. Routers and access points designed for home use are unable to meet such demands.

TP-Link's Omada EAP Series products provide secure, stable and cost-effective indoor solutions engineered to meet the networking needs of today's businesses. With 20 years of networking experience behind us, TP-Link has an outstanding track record as a commercial wireless network solutions provider, owing to our dedicated technical support team and trusted partners.

Application Scenarios

The solution provided here applies to the following customers and application scenarios:
1. Bars, cafes, restaurants, supermarkets, conference rooms, offices and other small indoor settings with between 20 and 100 clients.
2. Sites that require business-class, high-speed and stable wireless access.
3. Customers that require portal authentication service, where products and services are advertised to guests when they connect.

For enquiries about the selection or implementation of these solutions, please contact TP-Link Technical Support.

Why TP-Link?

1. 20 years of experience delivering quality products at an affordable price
2. Over 1000 global professional and reliable partners
3. Effective, economical and reliable wireless solutions
4. Diverse range of products available for your business
5. Outstanding technical support with both pre-sales and post-sales support
6. Free and dependable global hotline support and warranty service available 24/7

Solution

This document will introduce two Wi-Fi networking solutions for small, single-subnet networks based on the two management modes of EAP products: Standalone mode and Cluster mode.

In Standalone mode, each EAP works independently as a standalone access point. Each EAP has its own web interface where it can be configured. Standalone mode is most suited to a relatively small-sized indoor environment where 1 to 3 access points are enough for complete coverage.

In Cluster mode, multiple EAPs will form a network cluster, and automatically elect a master access point as the

centralized management device. Cluster mode supports unified management and configuration, meaning the settings of the master access point are applied to all others, and is suitable for indoor business environments that require 5 to 10 access points. Cluster mode allows up to 24 access points in each cluster.

The TP-Link EAP solution contains the following parts:
**A: Solution Overview and Network Topology Description.**
B. Wired Network Deployment and Configuration Guide.
C. Wireless Network Deployment and Configuration Guide

Note: Aside from Cluster mode and Standalone mode, Omada EAPs can also be centrally configured and managed using EAP Controller software. For small network scenarios, however, Cluster mode or Standalone mode are generally recommended. For more information about EAP Controller software, please visit the TP-Link website.

A. Solution Overview and Network Topology Description

Solution 1--- Indoor Wi-Fi Networking Solution based on EAP Standalone Mode
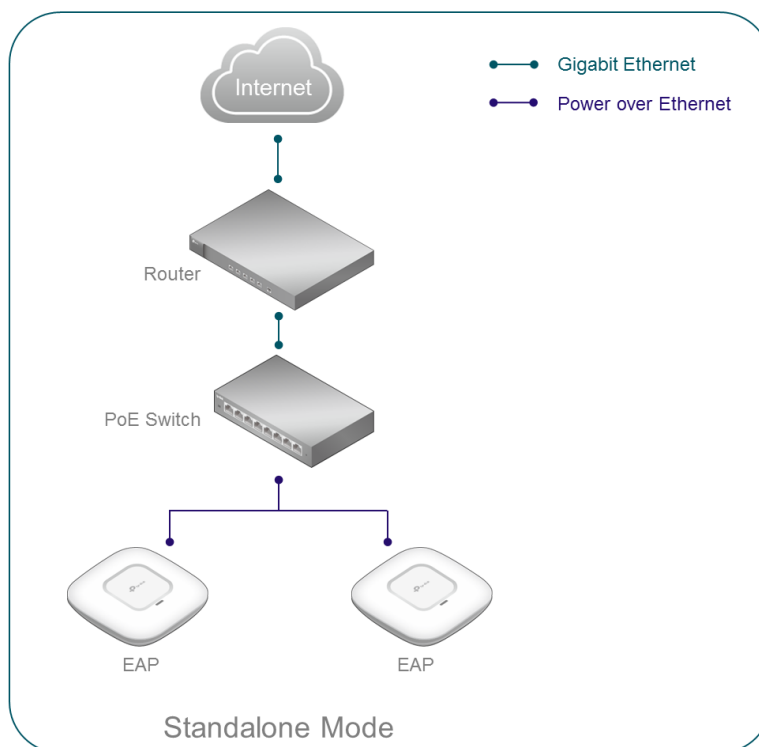
As shown above:
1)   EAP products can expand a wireless network without changing the existing wired infrastructure.
2)   Without additional controller devices, you can directly configure and manage each EAP through its web interface.
3)   A plug-and-play Standard PoE power supply is used for easy deployment.

Solution 2 ——Indoor Wi-Fi Networking Solution based on EAP Cluster Mode
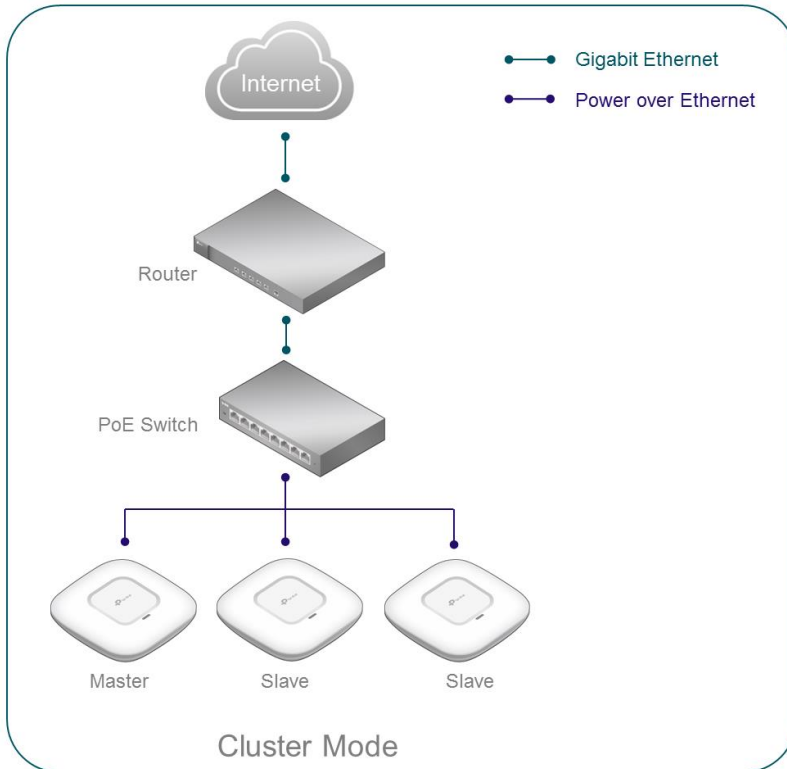
Cluster Mode

As shown above:

1) Use EAP products to expand a wireless network, without changing the existing wired network topology.
2) Use Cluster mode's centralized management to manage up to 24 EAP units without additional controller devices.
3) A plug-and-play Standard PoE power supply is used for easy deployment.

Note: Among the current TP-Link EAP products, only EAP 115 supports Cluster mode.

You can decide an appropriate number of EAPs for your indoor wireless network by considering the area where wireless coverage is needed and the number of clients during peak usage. The recommended number of wireless clients for each EAP is 25. (For dual-band EAPs the number is 50, or 25 for each band.) A single EAP has a range of 15 meters. For guidelines on the number of EAPs needed in an ideal environment, you can refer to the test report in Part C of this document, entitled "Wireless Network Deployment and Configuration Guide 3: EAP Product Deployment". However, please note that the actual number of required EAPs will depend on the environment they are deployed in, since wireless signal is affected by obstacles, RF interference and other factors.

B. Wired Network Deployment and Configuration Guide

1. Wired Network Deployment and Configuration Guide 1: Gateway Selection

There are no special requirements for the gateway router, but you need to consider the performance of the router, such as the number of concurrent connections, NAT throughput, etc., in order to provide stable internet access to multiple wireless clients. TP-Link offers various SMB routers. In this solution, we recommend using the following TP-Link SafeStream Routers as the gateway device:

Model	TL-ER6020	TL-ER604W	TL-R480T+	TL-R470T+
Concurrent Connections	30000	10000	30000	10000
Recommended number of Connected Devices	150	50	150	50
NAT Throughput	180Mbps	160Mbps	80Mbps	80Mbps
Maximum WAN ports	2	2	4	4

To learn more about our SafeStream VPN Routers and SafeStream Load Balance Routers, please visit our official website.

2. Wired Network Deployment and Configuration Guide 2: EAP Power Supply Selection

PoE (Power over Ethernet) allows a single cable to transfer both network data and electrical power. Using PoE switches can simplify network deployment and save costs since there's no need to install additional power cabling. TP-Link provides different levels of PoE switches with a variety of port numbers, which can meet the requirements of PoE power supply and network access in various scenarios. In this solution, we recommend using the following PoE switches:

Model	TL-SF1008P	TL-SG1008P	TL-SG1008PE	T1500G-10MPS	T1500-28PCT
Standard	802.3af	802.3af	802.3at	802.3at	802.3at
PoE+ Ports	4	4	8	8	24
Power Supply	57w	55w	124w	116w	180w
Ethernet Ports	8 Fast RJ-45 ports	8 Gigabyte RJ-45 ports	8 Gigabyte RJ-45 ports	8 Fast RJ-45 ports 2 Gigabit SFP Slots	24 Fast RJ45 Ports 4 Gigabit RJ45 Ports 2 Combo Gigabit SFP Slots
Configuration	Desktop	Desktop	Desktop/ Rackmount	Desktop/ Rackmount	Rackmount

In addition, different TP-Link EAP products support different standards of PoE power supply. PoE power supply standards adopted on the TP-Link Omada series EAP are listed for reference in the following table:

model	EAP320	EAP330	EAP245	EAP225	EAP115	EAP115-wall	EAP110
PoE Standard	802.3at			802.3af			Passive PoE

Find out more about TP-Link PoE switches on our official website.

Note 1: The maximum allowed continuous output power per cable in IEEE 802.3af is 15.40W. An upgraded specification, IEEE 802.3at, offers up to 30W on each port. Thus 802.3at PSE (power source equipment) is backward-compatible with 802.3af PD (powered device). The IEEE 802.3af PoE switch cannot provide power to the 802.3at devices such as EAP320, EAP330, and EAP245. However, the 802.3at standard PoE switch can power either 802.3af or 802.3at standard EAPs.

Note 2: EAP110 supports passive PoE, which requires an out-of-box passive PoE adapter or injector for power supply but can't be powered by an 802.3af/ 802.3at PoE switch. The sketches of standard PoE power supply

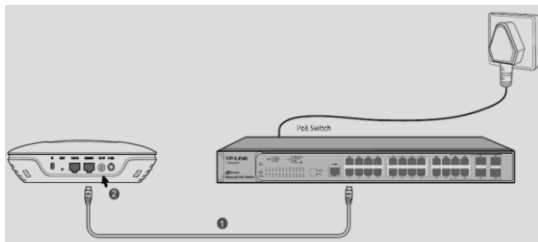and Passive PoE power supply are shown below:
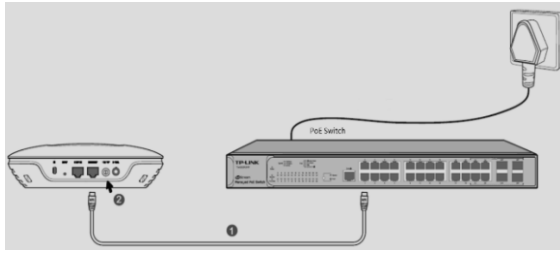
Standard PoE Power Supply
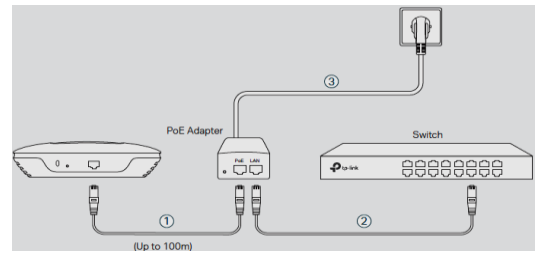
Passive PoE Power Supply

If you do not have a standard PoE switch or Passive PoE Adapter, you can also use the DC Power Adapter that comes with the EAP product. However, when using a power adapter for power supply, the location of your EAP may be limited by the location of power sockets.

Standard PoE Power Supply
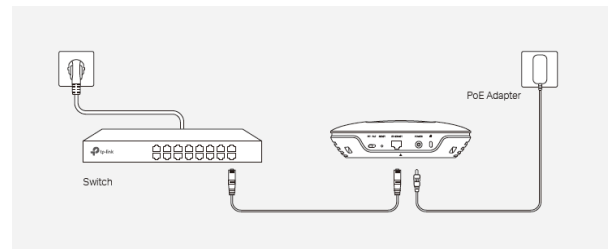
External power adapter power supply

C. Wireless Network Deployment and Configuration Guide

1. Wireless Network Deployment and Configuration Guide 1: Solution Selection

Cluster mode supports centralized management, and does not require any other software or hardware devices. Only EAP115 supports Cluster mode. If you are going to use Cluster mode for management, you need to use the EAP115. If your network is small and contains only 1-3 EAP products, then Standalone mode may also be suitable for management.

Using EAP Cluster mode or EAP Standalone mode has the following advantages:
● Deployment is convenient. There's no need to change the existing wired network.
● There is no need for an additional controller. EAPs can be managed directly through the web interface.
● EAP products can provide stable business-standard Wi-Fi.

2. Wireless Network Deployment and Configuration Guide 2: EAP Product Selection

TP-Link provides different levels of 11n/11ac EAP products to meet different requirements. See the table below for details.

Please note that EAP115 is the only product that supports Cluster mode.

model	EAP330	EAP245	EAP320	EAP225	EAP115	EAP115-Wall	EAP110
Wireless Throughput	2.4GHz:600Mbps 5GHz:1300Mbps	2.4GHz:450Mbp 5GHz:1300Mbps	2.4GHz:300Mbps 5GHz:867Mbps		2.4GHZ: 300Mbps		

Internal Antennas	2.4GHz:3*6dBi 5GHz:3*7dBi	2.4GHz:3*4dBi 5GHz:3*4dBi	2.4GHz:2*6dBi 5GHz:2*7dBi	2.4GHz:2*4dBi 5GHz:2*4dBi	2.4GH: 2*3dBi	2.4GHz: 2*1.8dBi	2.4GHz: 2*3dBi
Captive Portal	√	√	√	√	√	√	√
Airtime Fairness	√	×	√	×	×	×	×
Beam forming	√	×	√	×	×	×	×
Band Steering	√	√	√	√	×	×	×
Load Balance	√	√	√	√	√	√	√
Management mode	EAP Controller、Standalone				EAP Controller、Standalone、Cluster	EAP Controller、Standalone	

Why choose 5GHz EAPs products?

1) The 2.4GHz band only has three available non-overlapping channels for transmission: 1, 6, and 11. The 5GHz band can provide a much larger number of channels.

Please note that due to different local regulations, available 5GHz channels differ between countries and regions. For example, in the United States twenty-two 5GHz channels are supported, while in Europe nineteen 5GHz channels are supported.

2) The 5GHz channel is much cleaner, with less interference. The 2.4GHz wireless band uses the same channel signals as other devices such as Bluetooth and microwave ovens, so it is more likely to experience interference in a noisy environment. Compatibility with 5GHz band Wi-Fi is becoming widespread, with greater and greater numbers of devices now supporting it. Furthermore, it allows dual-band EAP products to handle larger numbers of simultaneous connections.

3. **Wireless Network Deployment and Configuration Guide 3: EAP Product Deployment**

1) **EAP Product Installation**

TP-Link EAP products can be ceiling-mounted, wall-mounted and ceiling-rail mounted. Installation methods are simple and fast. The installation procedure differs between EAP products.
- The installation of EAP330 and EAP320 is the same. For details, please see the EAP320 Installation Guide.
- For the installation of EAP225 and other EAP products, please see the EAP225 Installation Guide.
- For detailed installation of EAP115-Wall, please see the EAP115-Wall Installation Guide.

2) **EAP Product Cabling**

If you are using EAP245 and other Standard PoE EAPs, you can simply use Ethernet cables to connect the EAPs to your network. To ensure normal communication and power transmission, we recommend that you use Ethernet cables that are Cat. 5E or above, with a maximum length of 100 meters.

If you are using EAP110 (This does not support Standard PoE, but does support Passive PoE.), any standard of Ethernet cable is fine. However, you need to consider the position of the power socket which supplies power to the Passive PoE Adapter.

Considering the simplicity and flexibility of wiring/cabling, if you have a Standard PoE switch, and the scale of your network is large, we recommend that you use the Standard PoE switch.

For every EAP product, you will need to decide the number of EAPs and where to install them based on your indoor environment. You should consider the following factors:

- Carpet Area: In theory, the wireless coverage of an access point can reach up to 500 square meters. However, the actual coverage may be less than that value, due to the effects of signal interference and obstacles.

- Number of Connections and Internet Behaviors: A single band (2.4GHz or 5GHz) of an AP has a recommended number of connected devices of 30, and the connected capacity of the 5GHz band is slightly more than that of the 2.4GHz band. A series of tests carried out with a selection of EAP products produced the following results when users streamed 720P HD videos:

	2.4 GHz			5 GHz	
	EAP330	EAP320	EAP110	EAP330	EAP320
Smooth Play*	28	26	25	40	38
Occasional Error**	30	30	30	42	42

* Smooth Play indicates the maximum number of connected devices when all clients are able to smoothly stream 720P HD videos.
** Occasional Error indicates the maximum number of connected devices when clients experience occasional buffering or pausing when streaming 720P HD videos.

- Obstacles: Obstacles cause varying degrees of wireless signal attenuation. To ensure complete coverage, try to install the EAPs in the center of an open room, which reduces the interference between the EAPs and their surroundings. It is recommended to test the signal reception in the corner of the room.

3) **Wireless Network Settings**

If you plan to use Solution 1—Indoor Wi-Fi Networking Solution in EAP Standalone mode, and have followed the steps to build the wireless network, you will notice the default wireless SSID is in the form TP-Link_2.4GHz_XXXXXX or TP-Link_5GHz_XXXXXX (XXXXXX is the last six hexadecimal bytes of MAC address). If you need to modify the SSID, Encryption or other settings, please log in to the EAP web management page. For the detailed steps, please refer to FAQ-1000.

If you plan to use Solution 2—Indoor Wi-Fi Networking Solution in EAP Cluster mode, please follow the corresponding steps to set up the wireless network. After that, when you first log in to the EAP115 web management interface, you will be prompted to choose to use the device in either Cluster mode or Standalone mode. Please select Cluster mode and then configure each EAP115 with the same Cluster Name. (The Cluster Name is "TP-Link" by default.) The EAP115 devices with the same Cluster name will automatically form a cluster group, and the longest running EAP will act as the Master device. After that, no matter which of the EAP115s' IP addresses you use to log in to the EAP web management interface, the page will automatically redirect to the Master device's management page. Any change to the

configuration of the Master device will be automatically synchronized to all access points within the Cluster. To learn more about the principle and configuration of Cluster mode, please see the Cluster mode (pages 12-68) section of the EAP115 User Guide.

4) Wireless Network Optimization

Once the wireless network is set up, you can access the internet or configure features such as wireless authentication, VoIP and more.

The following features can help to build a more stable wireless network:

- **Load Balance**
  Load Balance attempts to distribute wireless clients evenly between access points. Clients with a weak wireless signal can also be removed from the network, creating a smoother connection for users. If you want to know more about how Load Balance works and how to enable Load Balance on TP-Link EAP products, please see the EAP Controller User Guide (page 61).
- **Band Steering**
  This feature is only supported on 2.4GHz/5GHz dual-band EAPs. When possible, dual-band clients will be connected to the cleaner and faster 5GHz network instead of the 2.4GHz band. This provides a better online experience for users on both bands since network traffic on the 2.4GHz band will also be reduced. If you want to know more about how Band Steering works and how to enable Band Steering on TP-Link EAP products, please see the EAP Controller User Guide (page 31).

4. Wireless Network Deployment and Configuration Guide 4: Improve Wi-Fi Access Experience

TP-Link Omada EAPs provide more than just basic Wi-Fi. They also provide a wealth of software features and value-added services, such as Captive Portal, Rate Limit, and Access Control.

1) By using Captive Portal Authentication, you can advertise your products or services while providing authentication for the users. TP-Link Omada EAPs support a variety of Portal Captive authentication types. Businesses can choose the most appropriate Captive Portal authentication type according to their network size, application scenario, customer base and other practical needs.

2) Rate Limit works by limiting P2P download speeds and other bandwidth intensive applications to ensure that all users have a good internet experience. With the Rate Limit function enabled, we can set up the maximum allowed upload and download rate for each client. This avoids situations where individual clients are taking up a large proportion of the bandwidth and slowing down the internet connection of other users.

3) Access Control & SSID Isolation provides users with an online environment where they can surf the internet in safety. By setting up Access Rules, some users are restricted in the network resources they can access. By setting up SSID Isolation, client devices of the same SSID can be isolated from each other. This reduces broadcast traffic on the network and also enhances security.